

gravitation from the stresses which must exist in the ether under the supposition of perfect elasticity.

The use of the principle of least work in investigations regarding the ether of space hence leads to negative results, as far as its applicability is concerned. It indicates, however, the important conclusion that the ether is not an elastic substance in which stresses are proportional to deformations, and accordingly studies concerning it should be based upon other suppositions concerning its properties. Since the ether cannot be made the object of experiment and since all we know concerning it is from rough analogy and indirect evidence, negative conclusions are valuable. By successively discussing and rejecting one assumption after another, it is possible that in due time properties of the ether may be found which will explain not only the inertia and gravitation of matter, but also the phenomena of electricity and magnetism.

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THE "FRANKLIN PAPERS" IN THE AMERICAN PHILOSOPHICAL SOCIETY.

BY J. G. ROSENGARTEN.

(*Read April 3, 1903.*)

In the collection of this Society there are some seventy large folio volumes of "Franklin Papers." Franklin left all his papers to his grandson, William Temple Franklin, who, after a long interval, published in London and Philadelphia six volumes of Franklin's works. Of course, this represented but a small part of his papers. Those used in the preparation of Temple Franklin's edition are now the property of the United States, which has never yet printed a Calendar of them. Temple Franklin selected from his grandfather's papers those that he thought suitable for publication, and left the rest in charge of his friend, Charles Fox, to whom he bequeathed them, and Charles Fox's heirs, in turn, after a long lapse of years, presented them to the American Philosophical Society, in whose custody they have remained ever since. They have been roughly classified, and are bound in a rude and careless way. Under the present efficient Librarian, Dr. Hays, a Calendar is being made as fast as the limited means at his disposal will per

mit, and when that is completed, it is hoped that it will be printed as a useful guide to the miscellaneous matter collected here. Sparks and Hale and Ford and Parton and Fisher and others who have written about Franklin have used them, but even the most industrious student may well be appalled at the labor required to master all the contents of these bulky volumes, representing Franklin's long and many-sided activity.

He kept copies of most of his own letters and the originals addressed to him, often endorsing on them the heads of his replies. These volumes contain papers from 1735 to 1790—the first forty-four volumes letters to him; the forty-fifth, copies of his own letters; the forty-sixth, his correspondence with his wife; the forty-seventh and forty-eighth, his own letters from 1710 to 1791; the forty-ninth, his scientific and political papers; the fiftieth, his other writings—notably his *Bagatelles*, those short essays which had such a vogue and are still read; the fifty-first, poetry and verse, his own and that of others, no doubt selected by him for use in his publications; the fifty-second, the Georgia papers—he was agent for that colony; and the remaining twenty volumes, all the multifarious correspondence, other than official, mostly during his long stay in France, his various public offices at home and abroad, his enormous correspondence about appointments from men of all nationalities, who wanted to come to America, under his patronage, to fight, to settle, to teach, to introduce their inventions, for every imaginable and unimaginable purpose.

Both in England and France he kept all notices of meetings, such as those of the Royal Society and other scientific bodies of which he was a member, invitations, visiting cards, notes, business cards, etc., and at home he kept copies of wills, deeds, powers of attorney, bonds, agreements, bills, etc., and drafts, cheques, bills of lading, public accounts, and even certified copies of Acts of Congress, and account books, and, in addition, Temple Franklin left eight volumes of letters to him from 1775 to 1790.

In this mass of material his biographers have found much that was of value, but there remains almost untouched the interesting correspondence of his friends in England during the years before and those of the War of Independence. There are examples of his own clever *jeux d'esprit* in the "Intended Speech for the Opening of the Parliament in 1774," in which the king himself is made to foretell the "seven or ten years' job" that his "Ministers have

put upon him to undertake the reduction of the whole Continent of North America to unconditional submission." His friend Hartley sent it to him in 1786, when the prophecy had been fully realized. Again in 1778 he received a full report of the famous dying speech of Chatham, and of that of Lord Shelburne in his defense of the American cause.

During these eventful years, his correspondents in England and in the Colonies kept him well informed both of the actions and plans of the Government and of the Opposition. Some of these may be of interest as showing how earnestly both sides were presented to him that he might use his influence to maintain peace. Priestley, who was then the Secretary of Lord Shelburne, writes from London, in February, 1776, with a due report of political and scientific information, and Lee and Wayne write to him during the campaign which was to end in Burgoyne's surrender, and thus contribute largely to the alliance with France, which owed so much to Franklin's influence not only with the French Court and French statesmen, but with the philosophers and the people.

His correspondence in Paris is a perfect picture of the time. One day he gets an invitation to attend experiments in electricity from a correspondent, Brogniart, who reports the successful treatment of sick people by electric fluid, in 1778, and soon after the Curé of Damvillers asks him for a cure for dropsy for one of his parishioners. One writer submits a plan for eliminating poverty in the United States, and Turgot asks what method Franklin advises for burning smoke and thus diminishing the consumption of wood, which was steadily getting dearer. Then comes from London an offer to disclose a method of refining common salt and using it to cure and preserve flesh and fish, for the modest fee of 2000 guineas. Genet, afterwards so well known from his troublesome career as French Minister in this country, reports progress made in August, 1778, in translation of the *Pennsylvania Gazette* accounts of battles for the French papers, and the same mail brings a letter asking Franklin's approval of mechanical and mathematical problems, and for news of Fouquet, Master Gunpowder Maker at York, Pa. Brogniart invites him to witness new experiments in electricity, and soon after he is told of a plan of six or eight Germans, men of letters and prominent position, to go to America to found a college, where the instruction can be given in Latin until the teachers have mastered English. He receives poems and eulogies

in all languages, and offers to write histories of the new Republic, provided Franklin will furnish material, maps, etc. Then comes a request to look into an invention to reunite broken bones in all cases of fracture. The Palatinate Academy of Sciences, at Mannheim, sends its works dealing with electricity, etc., and urges establishing a German Scientific Society in Philadelphia.

A man and wife, with six children and six farm laborers, desire to settle in America, and ask Franklin to get Congress to give them land near Philadelphia, enough for the support of twenty persons, their connections. Franklin notes that his reply was that land was so cheap in Pennsylvania, that there was no need to apply to Congress.

Then came an offer to establish a Swiss clock and watch factory at Boston or Philadelphia. Even Franklin's patience was tried by a request to explain the right of America to assert its independence, for on this letter he endorsed "Impertinent."

The letters are a perfect picture of Franklin's busy social life in Paris, with politics, science, literature, war, privateering, all represented in his correspondence.

There are many letters from John Paul Jones about his naval exploits, and frequent appeals for help in securing the release of prisoners captured at sea, for help to return them and other Americans in distress to their homes. Dr. Price writes from London to know if it is true that Washington is grown unpopular, and that his army deserts in great numbers, and that the suffering in America is excessive. William Strahan reminds Franklin that in 1763 he spoke of America as England's strongest ally and of France as that perfidious nation. Vaughan sends to Chaumont (who reports it to Franklin) a message of greeting for their friend who always carried spectacles on his nose and kingdoms on his shoulders.

His correspondence came from England and from all parts of the Continent and from the West Indies in an unending stream.

A very curious letter is one from Richard Penn, dated London, October 20, 1778, which I think has never been printed :

"*Dear Sir* :—Nothing but necessity could have induced me to take the liberty of begging your attention for a few moments, from those various and important affairs with which you are entrusted, and which you have executed with so much reputation to yourself and advantage to your country; at the same time I am aware that the name subscribed will not at first sight bring you much in favour

of the writer. Nevertheless I have too high an opinion of your character to imagine that any misunderstanding which might formerly have subsisted between you and any part of my family, in which I myself could have had no share, will not at all prejudice you against me and in any degree withhold you from lending me your advice and perhaps assistance upon the present occasion. I flatter myself I have some slight ground to go upon in this case, which I own I am most willing to catch at.

"I am married to your late ward, the eldest Miss Masters, and have now living with me her younger sister, still under age, and, of course, in a manner claiming your patronage, as well as their mother, the widow of your late friend. From this connection it is well known that I possess a very considerable property in the city of Philadelphia and its environs, besides two or three valuable estates of my own in the Province of Pennsylvania, a whole undivided Proprietary of New Jersey; yet with all this property, I have not been able for more than two years past to procure one shilling from that country, nor have during that time so much as received a line from my friend and agent, Mr. Tench Francis, who it is probable has at this time a handsome sum of money belonging to me in his hands. The purse I brought with me to England is nearly exhausted, tho' it has been managed with the strictest economy. I have not yet tried, nor would I willingly at present, what American security would produce in this country.

"I should think myself infinitely obliged to you if you could point out to me in what manner I could procure either from America, or in any other way, a temporary subsistence. I have not a doubt but that in time matters will turn out much to the advantage of everybody concerned and connected with that country.

"Let me entreat you to favor me with an answer to this letter under cover to my Bankers, Messrs. Barclay, Bevan & Co., No. 56 Lombard street, in doing which you will lay a lasting obligation upon one of the many who revere your character and admire your abilities.

"Give me leave to subscribe myself, Dear Sir,

"Your very sincere friend,

"RICHD. PENN."

When it is remembered that the hostility of the Penns to Franklin was so strong that Governor John Penn declined to be Patron

of the American Philosophical Society because it had chosen Franklin for its President, and that Richard Penn had been Lieutenant Governor (as Deputy for that uncle and his brother) from 1771 to 1773, it must have been difficult for Franklin not to feel that such a letter from such a man was indeed a tribute to his position, achieved solely by his own efforts.

From this mass of correspondence, I have selected some letters showing the state of public opinion in New England in 1774, and from London in 1775, including a characteristic letter from Priestley and from Charles Lee and Wayne in the field. Much more might be printed to show how well Franklin kept in touch with all that was of interest during his long and busy career. It is well that this venerable Society, so largely the result of his labors, should be made the custodian of the papers that follow almost his daily thoughts, and it is to be hoped that the preparation and publication of a Calendar showing their contents may be completed at no distant day, certainly by the two hundredth anniversary of the birth of our founder, and thus perpetuate his memory.

Franklin's legacy to the Philosophical Society was ninety-one volumes of the *History of the Royal Academy of Sciences* at Paris, thus helping that collection of publications of scientific societies that make so valuable a portion of its Library.

THE ORBIT OF THE DOUBLE STAR Σ 518.

BY ERIC DOOLITTLE.

(*Read April 3, 1903.*)

INTRODUCTION.

It is well known to astronomers that many of the stars of the sky which to the naked eye appear to be but single stars are when viewed with the telescope seen to be made up of two or more stars very close together. About twenty thousand such double stars have been measured and catalogued, and the number is continually being added to through the discoveries of the great modern telescopes. There are scarcely fifty of these, however, of which a determination of the orbit is possible.

It was in the years 1802 and 1803 that the classic memoirs of Herschel appeared, in which it was shown for the first time that